

APPENDIX 2

Appendix 2

AT&T Wireless Services approached Lorch Microwave to design commercially viable filters which could be used to supplement the inadequate filtering of public safety handsets. These are the design requirements given to Lorch:

- Filters must be small enough to be used either outside the handset as a short term filtering solution or inside the handset as a part of a long term handset redesign effort.
- Filters must have insertion loss less than 2 dB.
- A separate filter specification is needed for each of the following three handset operations scenarios:
 - Interleaved band only
 - NPSPAC band only
 - Both interleaved and NPSPAC bands

Interleaved Band Solution

For public safety handsets operating in the interleaved band only (854.75 – 861 MHz), Lorch Microwave recommends the use of a notch filter to attenuate the Upper 200 band (861-866 MHz), NPSPAC band (866-869 MHz), and cellular A band (869+ MHz). The filter has less than 1 dB of insertion loss.

Table 1. Filter Performance for Interleaved Band Solution

Band	Frequency, MHz	Filter's Attenuation, dB
Low end of Upper 200 Band	861	2
Low end of NPSPAC Band	866	10
Low end of Cellular Bands	869	25
Cellular Bands	872	10
Cellular Bands	877	2

For handsets operating only in the interleaved band, this filter effectively attenuates Nextel and cellular signals. This filter's attenuation is additive to any filtering the public safety handset already has.

The approximate size of the ceramic filter is 0.75" by 0.75" by 0.5" including the SMA connectors when configured for use as an handset-external filtering solution. The filter still needs to be impedance matched to the antenna. Having connectors on the filter may cause new points of failure due to mechanical stress placed on the handset during use. Additional design work should be done to enclose the filter package with the antenna so that there is a single connector to connect the antenna/filter package to the handset.

NPSPAC Band Solution

For public safety handsets operating in the NPSPAC band only, Lorch Microwave recommends the use of a notch filter to attenuate the Upper 200 band (861-866 MHz) and interleaved band (854.75 – 861 MHz) where Nextel operates. The filter has less than 1 dB of insertion loss.

Table 2. Filter Performance for NPSPAC Band Solution

Band	Frequency, MHz	Filter's Attenuation, dB
Television Channel 69	850	2
Interleaved Band	855	10
Interleaved Band	858	25
Low end of Upper 200 Band	861	10
High end of Upper 200 Band	866	2

For handsets operating only in the NPSPAC band, this filter effectively attenuates Nextel signals. This filter's attenuation is additive to any filtering the public safety handset already has.

The approximate size of the ceramic filter is 0.75" by 0.75" by 0.5" including the SMA connectors when configured for use as an handset-external filtering solution. The filter still needs to be impedance matched to the antenna. Having connectors on the filter may cause new points of failure due to mechanical stress placed on the handset during use. Additional design work should be done to enclose the filter package with the antenna so that there is a single connector to connect the antenna/filter package to the handset.

Interleaved and NPSPAC Bands Solution

For public safety handsets operating in the NPSPAC and interleaved bands, Lorch Microwave recommends the use of a low pass filter to better attenuate the cellular bands (869+ MHz). The filter has less than 2 dB of insertion loss.

Table 3. Filter Performance for Interleaved & NPSPAC Band Solution

Band	Frequency, MHz	Filter's Attenuation, dB
Low end of Cellular A Band	869	2
Cellular	882	10
-	915	>30

For handsets operating in the both the interleaved and NPSPAC bands, this filter provides modest improvements in performance. This filter's attenuation is additive to any filtering the public safety handset already has.

The approximate size of the ceramic filter is 1.5" by 0.5" by 0.4" including the SMA connectors when configured for use as an handset-external filtering solution. The filter

still needs to be impedance matched to the antenna. Having connectors on the filter may cause new points of failure due to mechanical stress placed on the handset during use. Additional design work should be done to enclose the filter package with the antenna so that there is a single connector to connect the antenna/filter package to the handset.